

**Roll No.**

**Total No. of Pages : 03**

**Total No. of Questions : 09**

**M.Sc. (Applied Physics) (2016 to 2017) (Sem.-1)**  
**SEMICONDUCTOR AND ELECTRONICS DEVICES**  
**Subject Code : MPH-104**  
**M.Code : 71604**

**Time : 3 Hrs.**

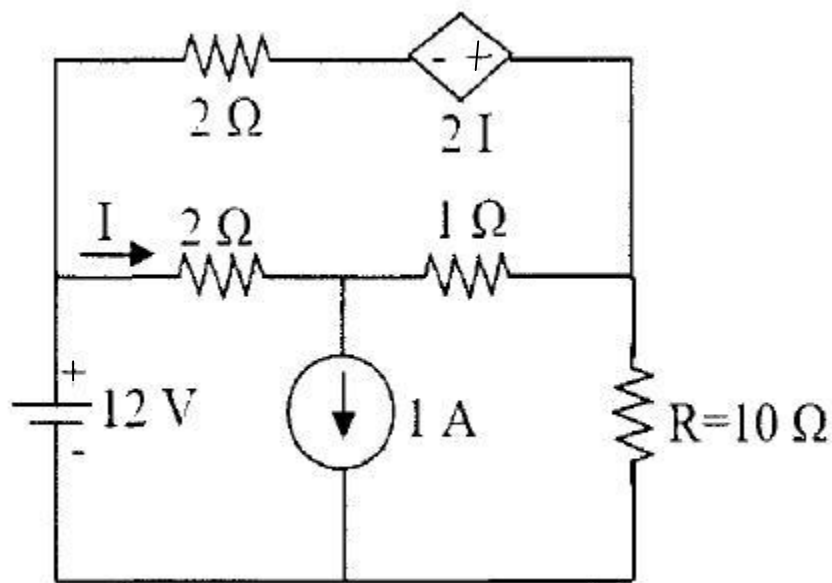
**Max. Marks : 100**

**INSTRUCTION TO CANDIDATES :**

- 1. Attempt FIVE questions in ALL including the compulsory question No-1.**

1. **Write briefly :** **(2.5×8=20)**
  - a) Differentiate semiconductors, conductors and insulators on the basis of band gap.
  - b) Why FET have better thermal stability?
  - c) Define CMRR and its significance.
  - d) What are the characteristics of a good comparator?
  - e) Define the mesh analysis of a circuit.
  - f) What are the performance characteristics of A/D and D/A converters?
  - g) Give the comparison between synchronous & Asynchronous counters.
  - h) Draw the logic diagram for SR latch using two NOR gates.
2.
  - a) What do you understand by a Extrinsic Semiconductor? Explain in detail, the formation of P-type semiconductor. (10)
  - b) Explain the construction and working of P-channel FET. (10)
3.
  - a) Give the capabilities and limitations of CMOS logic. Explain the CMOS transistor circuit. (10)
  - b) The data sheet enhancement type MOSFET reveals that  $I_{D(ON)} = 10 \text{ mA}$  at  $V_{GS} = -12\text{V}$  and  $V_{T(ON)} = -3\text{V}$ . Is this device P-channel or N-channel? Find the value of  $I_D$  when  $V_{GS} = -6\text{V}$  (10)

4. a) Two resistances when they are in series have an equivalent resistance of 9 ohms and when connected in parallel have an equivalent resistance of 2 ohms. Find the resistances and ratio of voltage and current sharing between the elements if the supply voltage is 50 V. (10)
- b) For the network shown in figure : (10)
- Determine the current through  $R=10\ \Omega$  resistor using Thevenin's theorem
  - Verify the result using Norton's theorem
  - Calculate the maximum power transfer through  $R$  and find the value of  $R$ .



**FIG.1**

5. a) Explain successive Approximation A/D converter in detail. (8)
- b) The 741C configured as an inverting amplifier and following parameters are given  $A = 4 \times 10^5$ ,  $R_1 = 1\text{K}\Omega$ ,  $R_i = 35\text{M}\Omega$ ,  $R_f = 4.9\ \text{K}\Omega$ ,  $R_o = 70\Omega$ , supply voltage  $= \pm 15\text{V}$ , maximum output voltage swing  $= \pm 13\text{V}$ , unity gain bandwidth  $= 0.6\ \text{MHz}$ ? Compute the closed loop parameters  $A_f$ ,  $R_{if}$ ,  $R_{of}$ ,  $f_f$  and  $V_{oot}$ . (12)
6. a) What are the ideal characteristics of an ideal operational amplifier? Derive the expression for voltage gain in non-inverting amplifier. (8)
- b) Draw the astable multivibrator using 555 timer and derive its frequency of oscillation.

(12)

7. a) Explain the IC voltage regulator LM-317. (10)
- b) Explain how a 4-bit R/2R register DAC works? (10)
8. a) Draw the circuit diagram of a 4-bit serial in / serial out shift register using D flip- flops. Also draw its timing diagram. (10)
- b) With suitable example design a sequential circuit using JK-flip flop. (10)
9. Write notes on **any two** :
- a) Triggering of bistable circuits (10)
- b) Wein bridge oscillators (10)
- c) VLSI circuits (10)

**NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.**